Factors predicting videoconferencing fatigue among higher education faculty

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Abstract

The online remote learning revolution in the era of the pandemic has resulted in the massive explosion of videoconferencing technologies. The emergence of a new phenomenon of exhaustion and fatigue experienced during virtual meetings is evident. This study examined the predictors of videoconferencing fatigue among higher education faculty in the Philippines. A total of 322 faculty participated in this cross-sectional study. The online survey was administered using the Zoom Exhaustion and Fatigue scale as the primary data collection tool. Significant predictors of videoconferencing fatigue were identified using the multiple linear regression analysis. The results indicated that the videoconference fatigue composite score of the faculty was 3.35 out of 5 suggesting a moderate level of fatigue. Significant predictors of videoconferencing fatigue among higher education faculty include attitude, sense of being physically trapped, mirror anxiety, emotional stability domain of personality, interval between videoconferences, and duration of videoconferences. For better videoconferencing experience among faculty, mechanisms to ease fatigue during virtual meetings may be proposed based on the study result.

Keywords Cross-sectional studies · Faculty · Fatigue · Philippines · Videoconferencing

1 Introduction

The global disease outbreak of COVID-19 has resulted in the massive use of video-conferencing technologies (Correia et al., 2020; Pedroso et al., 2021). Zoom meeting

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participants increased by 290%, and its competitor, Google Meet is adding about three million users per day (Iqbal, 2021; Moreno, 2020). In the educational context, schools transitioned from traditional classroom instruction to a distance or online learning modality to decongest classrooms during physical distancing measures (Moralista & Oducado, 2020). As a result of this shift in educational modality and face-to-face means was not feasible and recommended, videoconferencing has been used extensively by teachers and students to generate more effective communication and assist in conducting synchronous lectures (Correia et al., 2020; Pedroso et al., 2021). Besides, videoconference platforms like Zoom, Google Meet, Microsoft Teams permit training, teaching, and learning to be delivered economically and efficiently (Gladović et al., 2020). Videoconferencing has been a game-changer in education as it allows both teachers and students to meet their educational goals (Adipat, 2021). Such a platform has several admirable features such as multimedia content sharing, recording functionality, and real-time interaction (Al-Samarraie, 2019). Some studies have also shown positive feedback from students on the use of videoconferencing tools (Fatani, 2020; Rahimi & Zilka, 2021). Indeed, online tools and digital media have significantly changed the delivery of instruction and learning methods (Chazen, 2020). It is estimated that the global eLearning market is projected to surpass 243 billion U.S. dollars by 2022 (Duffin, 2020).

Notwithstanding the usability and benefits of videoconferencing tools in the current COVID-19 pandemic scenario and restricted mobility (Riedl, 2021), the extensive and rapid transition from face-to-face interactions to virtual interactions and the radical and massive use of videoconferencing in education has exposed vulnerabilities and raised concerns about the relatively novel experience of physical and mental toll during virtual meetings not only among students but teachers and school executives as well (de Sobral et al., 2022; Schroeder, 2021). This new phenomenon is called videoconferencing fatigue or more popularly known as Zoom fatigue, which refers to the feeling of exhaustion and fatigue associated with using videoconferencing (Fauville et al., 2021a, b; Riedl, 2021). Posited as part of computer-mediated communication exhaustion (Nadler, 2020), videoconferencing requires more focus and is agreed to be more psychologically demanding than face-to-face interaction for several reasons (de Sobral et al., 2022; Williams, 2021). It has also been found to be more exhausting than meetings held through other media (Shoshan & Wehrt, 2021a, b). For students and professors, listening and watching lectures and conducting classes can be difficult and tiring after a certain time (McMurtrie, 2020). It is argued that if the symptoms of virtual meeting fatigue occur frequently and are not properly managed, this can be disadvantageous and detrimental to the teaching and learning environment (García-Bullé, 2020).

The phenomenon of videoconferencing fatigue has caught the attention of researchers, scientists, and scholars alike. While research on videoconferencing fatigue is still considered in its early stages, a growing number of scholars have been trying to understand the causes and factors contributing to fatigue during videoconferences. Early works about Zoom fatigue were conducted by researchers at Standford University (Fauville et al., 2021a, b). Other scholars studied online fatigue to describe pandemic-related fatigue deriving from overusing technology and the Internet (Bonanomi et al., 2021). The prevalence of videoconferencing fatigue and its

associated factors in the context of education have also been examined (de Sobral et al., 2022; Mariappan & Nordin, 2021; Massner, 2021; Oducado et al., 2021ac). The communication patterns of students and teachers on the Zoom application have also been explored (Salsabila et al., 2021). Additionally, the influence of videoconference fatigue on mental health has also been investigated (Blandin et al., 2021; Oducado et al., 2021c). However, research on contributory factors to videoconferencing fatigue among faculty members is still limited. Likewise, there is still little attention on videoconferencing fatigue in the local setting.

Exploring and understanding the variables that contribute to high fatigue levels is essential so that measures can be made to address these factors. Moreover, examining videoconferencing fatigue and its predictors is necessary to carefully plan educational strategies in online learning using videoconference technologies to support teaching and learning activities while safeguarding the physical and mental health of teachers and students (Oducado et al., 2021b). Hence, this study was conducted to determine the predictors of videoconference fatigue among higher education faculty in a state-funded university in the Philippines.

2 Methods

2.1 Research design, sample, and data collection

To determine the predictors of videoconferencing fatigue, a quantitative cross-sectional research design was used. Out of 606 faculty members in a public university in Iloilo, Philippines, 322 answered the online survey in July 2021. Reminders were given to increase the response rate. At the end of the data collection period, the response in the online survey rate reached 53%. The Google Form was the platform utilized in the creation of the survey and collection of data. The preliminary part of the survey included an introduction and details of the study. The link to the survey was first forwarded to the Deans of the different colleges and administrators of six campuses, who then posted the survey link in the exclusive chat groups of the faculty. This study was conducted in accordance with the Helsinki Declaration and Data Privacy Act of the Philippines. Before participants could proceed with answering the survey, they had to first click, "Yes, I am willing to participate in the study" as proof of consent. The principles of anonymity, privacy, and confidentiality were followed throughout the study.

2.2 Measures

The 15-item Zoom Exhaustion and Fatigue (ZEF) scale by Fauville et al., (2021a) answerable on a 5-point Likert scale (1 = "not at all/never" to 5 = "extremely/always") was adopted to determine the Zoom fatigue levels of the faculty. The computed Cronbach's alpha of the entire ZEF scale in this study was 0.95. The attitude towards videoconferencing (3 items), and the frequency (1 = "1" to 7 = "7 and more"), duration (1 = "Less than 15 minutes" to 5 = "More than an hour"), and interval (1 = "Less than 15 minutes" to 5 = "More than an hour") of videoconferencing in a typical day

were also asked following the study of Fauville et al., (2021a). The five nonverbal mechanisms specific to video conferencing implementation that may result in fatigue adopted on the work of Fauville et al., (2021b) were also asked. These nonverbal mechanisms were mirror anxiety (3 items), being physically trapped (3 items), hyper gaze from a grid of staring faces (single item), and the cognitive load from producing (single item) and interpreting (single item) nonverbal cues. All items that asked about the nonverbal mechanism were answerable on a 5-point Likert scale (1 = "not at all/ never" to 5 = "extremely/always"). The personality traits of faculty were assessed using the Ten Item Personality Inventory (TIPI) by Gosling et al., (2003). All items on the TIPI were on a 7-point Likert scale (1 = "strongly disagree" to 7 = "strongly agree"). Developers of the instrument reported the acceptable test-retest reliability of the TIPI (Gosling et al., 2003). Demographic variables data (age, gender, campus), the device typically used for videoconferencing, and Internet connection stability information were also collected.

2.3 Data analysis

Data analysis was done using the IBM Statistical Package for Social Sciences software version 23, employing statistical tests such as t-test for Independent samples, one-way Analysis of Variance, and Pearson correlation to test for significant associations. Multiple linear regression analysis (step-wise) was used to determine predictors of videoconferencing fatigue. The result was considered significant if p-value was less than 0.05 alpha. The descriptive data were presented using frequency, percentage, mean and standard deviation.

Table 1 Profile and personality of participants (n=322)

Categories	M	SD	f	%
Age (in years)	44.66	9.48		
Gender				
Male			103	32.0
Female			219	68.0
Campus				
Main Campus			140	43.5
External Campuses			182	56.5
Internet connection stability				
Not stable			61	18.9
Somewhat stable			214	66.5
Very stable			47	14.6
Personality				
Extraversion	4.37	1.05		
Agreeableness	5.49	1.03		
Conscientiousness	5.55	1.01		
Emotional stability	5.13	1.11		
Openness to experiences	5.59	0.96		

3 Results

3.1 Profile and personality of participants

Table 1 shows that the participants' average age was 44.66±9.48. The majority were females (f=219, 68%), from the external campuses (f=182, 56.5%), and had a somewhat stable Internet connection (f=214, 66.5%). The mean scores in the five Personality domains are as follows: extraversion 4.27±1.05, agreeableness 5.49±1.03, conscientiousness 5.55±1.01, emotional stability 5.13±1.11, and openness to experiences 5.59±0.96.

3.2 Device, usage, attitude, and non-verbal mechanisms

Table 2 shows that 41.35% had taken all or most of videoconferences from a computer. The mean score on the usage or intensity of videoconferences were: duration (4.50±0.87), interval (3.90±1.28), and frequency (1.71±0.89). The mean score on the attitude scale was 3.08±48. In terms of five nonverbal mechanisms, the following mean scores were obtained: mirror anxiety (2.90±0.92), feeling physically trapped (3.47±0.78), hyper gaze from a grid of starring faces (2.63±1.08), the cognitive load associated with producing nonverbal cues (2.96±1.06), and cognitive load associated with producing nonverbal cues (2.97±0.91).

3.3 Videoconference fatigue composite score and subscales

It can be gleaned from Table 3 that the composite ZEF score of faculty was 3.35±0.76. In terms of the five subscales, the highest mean score was obtained in the visual fatigue subscale (3.57±0.91) and general fatigue subscale (3.50±0.83), and the lowest was in the emotional fatigue subscale (3.02±0.92).

Table 2 Device, usage, attitude, and non-verbal mechanisms

Categories	M	SD	f	%
Device				
All or mostly taken from a computer			133	41.3
Half taken from computer or half from mobile device			110	34.2
All or mostly taken from a mobile device			79	24.5
Duration	4.50	0.87		
Interval	3.90	1.28		
Frequency	1.71	0.89		
Attitude towards videoconferencing	3.27	0.67		
Nonverbal mechanisms				
Mirror anxiety	2.90	0.92		
Physically trapped	3.47	0.78		
Hyper gaze from a grid of starring faces	2.63	1.08		
Cognitive load linked to producing nonverbal cues	2.96	1.06		
Cognitive load linked with interpreting nonverbal cues	2.97	0.91		

Table 3 Videoconference fatigue composite score and subscales

Zoom fatigue	M	SD
General	3.50	0.83
Visual	3.57	0.91
Social	3.20	0.98
Motivational	3.44	0.92
Emotional	3.02	0.92
ZEF score	3.35	0.76

3.4 Correlates of videoconference fatigue

Table 4 presents the correlates of videoconference fatigue. Statistical analysis using

Table 4 Correlates of videoconference fatigue

Variables	M	SD	Test statistics	p-value
Gender[†]			-1.336	0.183
Male	3.36	0.84		
Female	3.38	0.72		
Campus[†]			2.071[*]	0.038
Main Campus	3.45	0.74		
External Campuses	3.27	0.77		
Internet connection stability[‡]			1.700	0.184
Not stable	3.47	0.78		
Somewhat stable	3.34	0.72		
Very stable	3.20	0.92		
Device[‡]			0.075	0.928
Computer	3.35	0.78		
Both computer and mobile device	3.36	0.72		
Mobile device	3.32	0.78		
Personality				
Extraversion[§]			−0.076	0.176
Agreeableness[§]			−0.120[*]	0.031
Conscientiousness[§]			−0.074	0.183
Emotional stability[§]			−0.234[*]	0.000
Openness to experiences[§]			−0.039	0.480
Age[§]			−0.117[*]	0.036
Duration[§]			0.161[*]	0.004
Interval[§]			−0.131[*]	0.018
Frequency[§]			0.113[*]	0.042
Attitude towards videoconferences[§]			−0.348*	0.000
Nonverbal mechanisms				
Mirror anxiety[§]			0.321[*]	0.000
Physically trapped[§]			0.362[*]	0.000
Hyper gaze[§]			0.258[*]	0.000
Cognitive load (producing)[§]			0.190[*]	0.001
Cognitive load (interpreting)[§]			0.084	0.132

[†]*t-test for independent samples*, [‡]*one-way ANOVA*, [§]*Pearson's r*, [*]*p<.05*

t-test for Independent Samples revealed that videoconference fatigue varied significantly according to campus (t=2.071, p=0.038) though the effect size was small (Cohen's d=0.2). Pearson correlation revealed that there was a significant inverse correlation between videoconferencing fatigue and age (r = -0.117, p=0.036), attitude (r = -0.348, p=0.000), personality domains of agreeableness (r= -0.120, p=0.031) and emotional stability (r = -0.234, p=0.000), and the interval between videoconferences (r = -0.131, p=0.018). Moreover, duration (r=0.161, p=0.004) and frequency (r=.113, p=0.042) of videoconferences, and the nonverbal mechanisms of mirror anxiety (r=.321, p=0.000), being physically trapped (r=0.362, p=0.000), hyper gaze from a grid of starring faces (r=0.258, p=0.000) and cognitive load linked to producing nonverbal cues (r=0.190, p=0.001) correlated significantly and positively with videoconference fatigue.

3.5 Predictors of videoconference fatigue

When the independent variables were entered in the regression model, step-wise multiple linear regression analysis in Table 5 revealed that attitude (β = −0.316, p=0.000), sense of being physically trapped (β=0.224, p=0.000), mirror anxiety (β=0.139, p=0.002), interval (β = −0.085, p=0.003) and duration (β=0.166, p=0.000) of videoconferences, and emotional stability domain of personality (β = −0.071, p=0.043) remained the significant predictors of videoconferencing fatigue among higher education faculty. The model was significant (F=23.263, p=0.000), and the five predictors explained more than one-fourth (30.7%) of the variance in videoconferencing fatigue.

4 Discussion

This research explored the factors predicting videoconferencing fatigue among teachers in a high education institution in the Philippines. This study revealed that feeling physically trapped, mirror anxiety, interval, duration, and emotional stability were significant predictors of videoconferencing fatigue among faculty. Most of the present research findings affirm the results of the proponents of the Zoom fatigue study from Standford University (Fauville et al., 2021a, b; Queiroz et al., 2021). The pres-

Table 5 Predictors of videoconference fatigue

Independent variables	β	t	p-value	95% CI for β	
(Constant)	3.145	9.214	0.000	2.473	3.816
Attitude	−0.316	-5.663	0.000	−0.425	−0.206
Physically trapped	0.224	4.395	0.000	0.124	0.324
Duration	0.166	3.880	0.000	0.082	0.250
Mirror anxiety	0.139	3.182	0.002	0.053	0.224
Interval	−0.085	-2.951	0.003	−0.141	−0.028
Personality (emotional stability)	−0.071	-2.035	0.043	−0.139	−0.002

Note: R=.553 R^2=0.307 Std. Error of the Estimate=0.640 F=23.263 p=.000

ent findings also replicate most of the results on factors affecting videoconferencing fatigue among students and school executives Oducado et al., 2021ac).

Consistent with prior research (Fauville et al., 2021a; Oducado et al., 2021b), this study found that attitude towards videoconferencing was the strongest predictor of videoconference fatigue. Better attitude towards videoconferencing is linked with the lesser videoconferencing fatigue among faculty. Perhaps, the experience in the use of videoconferencing tools may have influenced the perception or attitude of faculty towards virtual meetings. Technical issues like when the faculty members are not familiar with the features of the Zoom application (Salsabila et al., 2021) may have resulted in a negative experience using the platform hence forming a negative attitude and possibly have amplified teachers' exhaustion with the use of the application.

It was also demonstrated in this study that the intensity of videoconferencing use in terms of interval and duration predicted videoconferencing fatigue. Results of this present investigation among teachers suggest that shorter intervals between video-conferences and longer time of virtual meetings were associated with higher levels of fatigue. With the exclusion of frequency for this study, the result corroborates the findings of scholars who first studied videoconference fatigue (Fauville et al., 2021a, b; Queiroz et al., 2021). The study among students also revealed that the frequency and duration of videoconferences predicted fatigue during virtual meetings (Oducado et al., 2021b). From the findings of related studies and this present study, it is relatively consistent that a longer duration of virtual meetings remains the most important factor among three measures of videoconferencing usage that corresponds to increased fatigue during virtual meetings. The extensive use of videoconferencing may lead to information overload which was found to be a determinant of Zoom fatigue (Ebardo et al., 2021). The result of this study suggests that school administrators and teachers should consider the length of virtual meetings when using videoconferencing tools for teaching and learning. Splitting the learning process into smaller or shorter learning units to make it more cognitively and psychologically less stressful such as in the case of micro learning may be done (Sun et al., 2015).

Bailenson (2021) theorized five nonverbal mechanisms specific to videoconference use that may cause feelings of exhaustion and fatigue. This study found that two nonverbal mechanisms (mirror anxiety and sense of being physically trapped) were significant predictors of virtual meeting fatigue. These two nonverbal mechanisms were described under the subdimension of self-related technological factors of videoconferencing fatigue which addresses self-related attentional aspects, own actions, and self-perception during the communication process (Döring et al., 2022). Analyses of data of school executives and samples from the Stanford study likewise noted that being physically trapped and mirror anxiety, along with the three nonverbal mechanisms identified by Bailenson (2021) were related significantly to Zoom fatigue levels (Fauville et al., 2021b; Oducado et al., 2021c). In addition, the finding of this study is similar to the result of Fauville et al., (2021b) wherein being physically trapped was found to be the most significant predictor of fatigue among the five nonverbal mechanisms. Scholars explained that mirror anxiety as elicited by the self-view during videoconference heighten self-focused attention and a sense of being physically trapped or reduced mobility triggered by the need to stay within the field of view of the camera contributes to fatigue experience during videoconfer-

encing (Fauville et al., 2021b). Knowing these factors may help develop guidelines in the use of videoconferencing platforms in education. While it may be surprisingly complicated to escape videoconferencing fatigue (Belanger, 2020), establishing basic meetings rules like turning on cameras only when necessary, taking breaks in between meetings, and creating a set-up that encourages movement are some possible ways to combat fatigue during video calls (Bennett et al., 2021; Ofgang, 2021).

Moreover, the personality domain of emotional stability had an inverse relationship with videoconferencing fatigue in this current study. Similar to our finding, it was noted by other scholars that more emotionally unstable individuals experience higher levels of fatigue than emotionally stable individuals (Fauville et al., 2021b). There is also evidence linking chronic fatigue with increased emotional instability (Poeschla et al., 2013). Understanding the role of personality behind videoconference fatigue may help in strategically devising interventions to reduce fatigue among different individuals with varying personality traits.

Meanwhile, this study found the overall ZEF score among faculty was 3.35 out of 5 suggesting a moderate level of fatigue. Research among students in the Philippines disclosed a higher overall ZEF score of 3.82 (Oducado et al., 2021a, b). On the other hand, lower ZEF scores (between 2.73 and 3.02) were reported by studies using the ZEF scale conducted abroad (Fauville et al., 2021a, b). A 48% prevalence of Zoom fatigue was also reported among medical students in Brazil (de Sobral et al., 2022). Furthermore, this study found that faculty experienced the highest level of fatigue on the visual and general fatigue subscales, a similar result noted among students (Oducado et al., 2020b). In another study, physical, emotional, and mental fatigue were reported when attending virtual classes (Mariappan & Nordin, 2021). It is necessary not to ignore the symptoms of fatigue associated with using virtual conferencing platforms among education stakeholders. Steps should be initiated to address this concern to better the teaching experience of the faculty.

5 Conclusion and recommendations

The widespread use of videoconferencing in teaching and learning during this pandemic has been found valuable. However, the use of virtual conference tools also created unexpected challenges and has raised some concerns among teachers experiencing symptoms of tiredness, and exhaustion after Zoom calls or virtual meetings. This research highlights that negative attitude towards videoconferencing, the intensity of use of videoconferencing technologies (longer meetings and shorter intervals), and nonverbal mechanisms (mirror anxiety and being physically trapped) contribute to the higher levels of videoconference fatigue experience of faculty. Also, certain personality traits may play a role and put a person at a higher risk of developing fatigue during virtual conferences. Considering that using videoconferencing in education may continue beyond the pandemic, this study suggests that for a better videoconferencing experience and to fully maximize the benefits of this platform, mechanisms to combat fatigue during virtual meetings may be proposed based on the result of the study.

6 Limitations

Shortcomings and limitations were encountered in the conduct of this study. Firstly, data for this research were gathered at a particular point (cross-sectional). It is difficult to conclude causal effect between variables. Also, although the result of this study is supported by prior research, the sample of this study was taken only from one university in the Philippines. It is not possible to generalize at this time. Additionally, the use of questionnaire in this study is subject to self-report bias. The original developers of the Zoom fatigue study have also warned of some variables that were measured using a single item compared to the use of a scale with a number of items (Fauville et al., 2021b). Future studies may validate the present findings, involve larger samples, improve some self-report measures, and employ experimental designs. The result of the present investigation extends the literature and adds to the body of knowledge on videoconferencing fatigue.

Data availability Statement The datasets of this study are available from the authors upon reasonable request.

Declarations

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